

Consular Agent Jouve, at Toulon, who has important vineyards of his own and whose experience I solicited, writes as follows:

Many experiments have been made in this region to protect vineyards against frost. The method of burning tar and other combustibles with a view to producing a dense smoke when frost is anticipated, is not specially efficacious, and is difficult, as fires must be lighted at the same time at a great number of places throughout the vineyard. To succeed well by the production of smoke, the vineyards should be located in the valley, and any wind will prevent the success of the experiment. In some districts the evil effects of frost are counteracted by leaving the branches uncut until the end of the cold season. By this method, if the terminal bud of the growing branch be frozen, the succeeding buds are unharmed. This, however, is a method which takes too much of the sap of the vine. In conclusion, all the processes of which I have heard are of uncertain practical value.

I have also the following information from Mr. F. Richter, a gentleman of large experience residing at Montpellier, in the heart of the wine-growing region:

The methods now known of preventing damage by frost are not always efficacious, and when the temperature falls below 4° or 5° C. (39° or 41° F.) at the level of the young shoots, the cases are rare when the method regarded as most efficacious provides a sufficient protection. The radiation of plants is diminished very sensibly during clear nights by the distribution of white powder upon the leaves, and the effect is the more pronounced in proportion as the green organs intended to be protected are the more evenly covered. This method has never been generally adopted, and it may be said at present that the method of fighting the frost most frequently employed is the creation of clouds of smoke.

In the vineyards the owners establish low piles of vine shoots mixed with brush and covered with earth, or perhaps straw mixed with green plants of all sorts, capable of forming a great deal of smoke. The intensity of the smoke is increased by sprinkling water upon the earth during combustion. Still more commonly, however, land owners make use of manufactured preparations such as the Lestout box and the Fumigène Mortier. These preparations are lighted generally in the morning, when the temperature is reached at which white frost is formed, and they are kept burning until after sunrise, so as to delay the thawing, which is as bad for the plants as the frost itself.

My California correspondent, who seeks this information, says that he has heard of the shooting of chemicals over vineyards, a process concerning which I have no information. The *Reveil Agricole*, published on January 21, 1906, refers to the use of chemicals for the purpose of overcoming the damage by frost, not by shooting the same over the vines and trees, but in the form of a fertilizer. This article says that experiments have been made with potassic fertilizers upon several fields of wheat. After a rigorous winter the parcel of ground untreated gave a crop less than one-half of that yielded by fields which had not suffered from cold, while another parcel of land which had been frozen and which had also been treated with this fertilizer gave a normal crop. M. Laroux, the Professor of Agriculture at Marseilles, reports that in a nursery at Gotha, Germany, the use of 400 kilograms, (881.84 pounds) of chloride of potassium per hectare (2.47 acres) saved all the trees from frost in 1900-1901, while trees not so treated were decimated in the proportion of from 10 to 20 per cent. The *Reveil Agricole* adds that this is not a simple coincidence, and that there is a specific and very curious action of potassic salts of which the writer does not pretend to know the explanation. At Dreux, on an experimental farm, parcels of wheat and lucerne which had not been treated with potassium were feeble and unsatisfactory after a hard winter, while on the same farm wheat and lucerne which had been given this chemical treatment were much more vigorous.

EARLY KNOWLEDGE OF THE TIDES AT PANAMA.

By R. A. HARRIS, of the Coast and Geodetic Survey. Dated Washington, D. C., March 19, 1906.

In Chapter IX of his *Sumario de la Natural Historia de las Indias* which was published in 1526, Oviedo y Valdez makes the first mention of a question which has continued to be of interest down to the present time, viz, the smallness of the tides in the Caribbean Sea and the greatness of the tides on the Pacific coast of Darien.

He compares the tides in the Caribbean Sea to those of the Mediterranean, and the tides on the Pacific coast to those found on the western coast of Europe; for the great difference between the tides of the ocean and of the Mediterranean was a fact known to geographers since the time of Aristotle. Equally long ago had the conclusion been reached that large tides, as a rule, belong to large seas.

In Oviedo's time the movements of the ocean were commonly ascribed to the westward motion of the *primum mobile* so that—

“*Ad coeli motum elementa (excepta terra) moventur.*”

However, Josephus Acosta (1539?–1600) considers the water to be too closely connected with the earth to partake of this general movement (Purchas his Pilgrimes, Vol. III, page 924); but in his remarks upon the tides he does not suggest any universal cause. (*Ibid.* pp. 929, 930.)

It seems from Oviedo's mention of the Mediterranean tides that he regards them as entirely derived from those in the Atlantic.

As a matter of fact, recent observations and study prove that the western portion of this sea is governed by the Atlantic in somewhat the manner indicated by Oviedo, while the eastern portion, from Sicily to the Levant, has a rise and fall of its own and is tidally independent of the Atlantic.

The small tides along the northern shores of Darien are due to the equilibrium tide of the western portion of the Caribbean Sea, while those of the eastern portion of this sea, although small, are derived from the Atlantic. The passages between the Lesser Antilles are numerous and often large; but the smallness of the outside rise-and-fall prevents the derived tide from being large in the Caribbean waters. This smallness of the outside ocean tide is due to the fact that a nodal line of a stationary oscillation extends from near the island of Guadeloupe in a northeasterly direction.

The large tides off Gibraltar and the port of Panama are due to the fact that a loop of a fundamental oscillating system lies near each of these two localities.

The semidaily range of tide at Panama is 12.6 feet, while at Colon it is but 0.6 foot.

It happens that when it is high or low water at Panama it is very nearly half tide level at Colon, and vice versa.

My attention was called to Oviedo y Valdez's account of the tides by Professor Abbe, who recently sent me a tentative translation of a few sections of the *Sumario*, made by Miss F. Isabelle Wilbur.

An English translation of extracts from the *Sumario* is given by Purchas in his *Pilgrimes*, Vol. III. That relating to the tides occurs on page 989, and is substantially the same as the matter just referred to, and reads as follows:

Of the increase and decrease (that is) rising and falling of our Ocean Sea, and South Sea, called the Sea of Sur.

I will now speake of certaine things which are seene in the Prouince, or at least in the Citie of *Golden Castile*, otherwise called *Beragua*, and in the coasts of the North Sea, and of the South Sea, called the Sea of *Sur*, not omitting to note one singular and marvellous thing which I have considered of the Ocean Sea, whereof hitherto no Cosmographer, Pilot, or Mariner, or any other, haue satisfied me. I say therefore, as it is well knowne to your Maiestie, and all such as haue knowledge of the Ocean Sea, that this great Ocean casteth from itselfe the Sea *Mediterraneum* by the mouth of the Strait of *Gibraltar*, in the which the water, from the end and furthest part of that Sea, euen vnto the mouth of the said Strait, either in the East toward the coast commonly called *Leuante*, or in any other part of the said Sea *Mediterraneum*, the Sea doth not so fall or increase, as reason would iudge for so great a Sea, but increaseth very little, and a small space: Neuerthelesse, without the mouth of the Strait in the mayne Ocean, it increaseth and falleth very much, and a great space of ground from sixe houres to sixe hours, as in all the coasts of *Spaine*, *Britaine*, *Flanders*, *Germanie*, and *England*. The selfe same Ocean Sea in the firme Land newly found, in the coasts of the same lying toward the North, doth neither rise nor fall, nor likewise in the Ilands of *Hispanola* and *Cuba*, and all the other Ilands of the same lying toward the North, for the space of three thousand leagues, but onely in like manner as doth the Sea *Mediterraneum* in *Italie*, which is in manner

nothing, in respect to that increase and decrease which the said Ocean hath in the coasts of *Spain* and *Flanders*. But this is yet a greater thing, that also the selfe same Ocean in the coasts of the said firme Land lying toward the South, in the Citie of *Panama*, and also in the coast of that Land which lyeth toward the East and West from that Citie, as in the Iland of *Pearles* or *Margarita*, which the *Indians* called *Tarrarequi*, and also in *Taboga* and *Oloque*, and in all other Ilands of the South Sea of *Sur*, the water riseth and falleth so much, that when it falleth, it goeth in manner out of sight, which thing I myselfe haue seene oftentimes. And here your Maestie may note another thing, that from the North Sea to the South Sea, being of such difference the one from the other in rising and falling, yet is the Land that diuideth them not past eightene or twentie leagues in breadth from Coast to Coast. So that both the said Seas, being all one Ocean, this strange effect is a thing worthy greatly to bee considered of all such as haue inclination and desire to know the secret workes of Nature, wherein the infinite power and wisdom of God is seene to be such as may allure all good Natures to reuerence and loue so diuine a Maestie.

RECENT PAPERS BEARING ON METEOROLOGY.

H. H. KIMBALL, Librarian.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a —

Bulletin of the American Geographical Society. New York. Vol. 38. Feb., 1906.

Abbe, Cleveland. The present condition in our schools and colleges of climatology as a branch of geography and of meteorology as a branch of geophysics. Pp. 121-123.

Abbe, Cleveland. A modified polar projection adapted to studies in dynamic meteorology. Pp. 126-128.

Rotch, A. Lawrence. Proof of the existence of the upper anti-trade and the meteorological conditions at lesser heights in the northern Tropics. Pp. 128-130.

Brown, Robert Marshall. Notes on the Mississippi River flood of 1903 and on floods of other years. Pp. 131-134.

Nature. London. Vol. 73. Feb. 1, 1906.

B., T. G. Variation of glaciers. Pp. 320-321.
— International Meteorological Conference at Innsbruck. Pp. 331-332.

Nature. London. Vol. 73. Feb. 8, 1906.

Report of the meeting of the Solar Commission at Innsbruck. Pp. 352-354.

Nature. London. Vol. 73. March 1, 1906.

Kingsmill, Thos. W. A 300-year climatic and solar cycle. Pp. 413-414.

Hildebrandsson, H. Hildebrand. Studies of clouds. Pp. 416-417.
Nature. London. Vol. 73. March 8, 1906.

Rotch, A. L[awrence] and Teisserenc de Bort, L[eon]. The vertical distribution of the meteorological elements above the Atlantic. Pp. 449-450.

Proceedings of the American Association for the Advancement of Science. Boston. Vol. 41. Feb., 1906.

Richards, Theodore W., and Jackson, Frederick G. A new method of standardizing thermometers below 0° C. Pp. 451-454.

Quarterly Journal of the Royal Meteorological Society. London. Vol. 32. Jan., 1906.

Moore, John W. The rainstorm of August 24-26, 1905, in eastern Ireland. Pp. 1-10.

Newton, William B. The aquameter. Pp. 11-13.

— Rainfall of China and Korea. [Extract from paper by T. Okada.] P. 28.

Sutton, J. R. Comparison between Glaisher's factors and Ferrel's psychrometer formula. Pp. 35-45.

Ball, John. A rapid method of finding the elastic force of aqueous vapor and the relative humidity from dry-bulb and wet-bulb thermometer readings. Pp. 47-52.

Meinardus, Wilhelm. Variations in the circulation of the North Atlantic and the phenomena connected therewith. [Translated by R. H. Scott.] Pp. 53-55.

Science. New York. New Series. Vol. 23. Feb. 16, 1906.

McKee, Ralph H. The primeval atmosphere. Pp. 271-274.

Science. New York. New Series. Vol. 23. March 9, 1906.

Tamura, S. Tetsu. Japanese meteorological service in Korea and China. Pp. 396-397.

Symons's Meteorological Magazine. London. Vol. 41. Feb., 1906.

W., A. The packing of meteorological instruments. Pp. 9-10.

Annuaire de la Société Météorologique de France. Paris. 54 année. Jan., 1906.

Teisserenc de Bort, L[eon]. Sur l'études des alizés et des contre-alizés sur l'Atlantique Nord. Pp. 9-14.

Durand-Gréville, E. Les cartes d'isobars par millimètre et la prévision journalière du temps. Pp. 27-32.

Teisserenc de Bort, L[eon]. Le concours de prévision du temps de Septembre 1905. Pp. 32-35.

Ciel et Terre. Bruxelles. 26 année. 1 fév., 1906.

Hergesell, H[ugo]. L'état actuel et l'avenir de la météorologie maritime. Pp. 567-575.

Ciel et Terre. Bruxelles. 26 année. 16 fév., 1906.

— La couche d'air chaud des régions élevées de l'atmosphère, [Note.] Pp. 610-612.

— Effets magnétiques de la foudre sur les roches volcaniques. [Note.] Pp. 615-616.

Revue Néphologique. Mons. Fév., 1906.

Bracke, A. Formation de ciel moutonne. Pp. 9-11.

B[racke], A. Le relief du sol et la pluie. Pp. 13-14.

Bracke, A. La direction des cirrus. Pp. 14-16.

Annalen der Hydrographie und Maritimen Meteorologie. Berlin. 34 Jahrgang. Heft 2, 1906.

Köppen, W. Die Drachenstation der Deutschen Seewarte. Pp. 49-62.

Annalen der Hydrographie und Maritimen Meteorologie. Berlin. 34 Jahrgang. Heft 3, 1906.

Köppen, W. Die Drachenstation der Deutschen Seewarte. Pp. 97-110.

Heyne, —. Die Witterung zu Tsingtau im Juni, Juli, und August 1905, nebst einer Zusammenstellung für den Sommer 1905. Pp. 110-114.

Aus dem Archiv der Deutschen Seewarte. Hamburg. 28 Jahrgang. No. 2, 1905.

Knoche, Walter. Ueber die räumliche und zeitliche Verteilung des Wärmegehalts der unteren Luftschicht. Pp. 1-46.

Gaea. Leipzig. 42 Jahrgang. März 1906.

— Die Bekämpfung des Nebels durch Elektrizität. Pp. 150-151.

— Die Störungen der Luft und des Wassers. Pp. 153-159.

Illustrirte Aeronautische Mitteilungen. Strassburg. 10 Jahrgang. Feb., 1906.

Wegener, Kurt. Die meteorologischen Schwierigkeiten der Drachenaufstiege. Pp. 33-40.

— Ein neuer Windmesser für direkte Ablesung. Pp. 85-87.

Meteorologische Zeitschrift. Braunschweig. Band 23. Feb., 1906.

Gockel, A[ibert]. Ueber den Ionengehalt der Atmosphäre. Pp. 53-67.

Klein, [Hermann Joseph]. Cirrus-Studien. Pp. 67-82.

Hann, J[ulius]. Der Pulsschlag der Atmosphäre. Pp. 82-86.

— Ergebnisse meteorologischer Beobachtungen in Ost-Spitzbergen 1894-94. P. 87.

Polis, P[eter]. Ergebnisse der Luftdruckregistrierungen zu Aachen 1896 bis 1903. Pp. 87-92.

Zöllner, S. Graphische Darstellung der täglichen Bestrahlung der Erde durch die Sonne in verschiedenen Monaten und Breiten. Pp. 92-94.

Less, E[mil]. Thévenet: Recherches sur la prévision du temps en Algérie. Pp. 94-95.

Mitteilungen von Forschungsreisenden und Gelehrten aus den Deutschen Schutzgebieten. Berlin. 18 Band. 4 Heft 1905.

Uhlig, C. Regenmessungen aus Deutsch-Ostafrika. Pp. 352-359.

— Resultate der meteorologischen Beobachtungen in Herbertshöhe. Pp. 360-367.

— Resultate der Regenmessungen in Kaiser-Wilhelmsland, im Bismarck-Archipel, auf den Karolinen, Marianen, und Marshall-Inseln. Pp. 368-375.

Hemel en Dampkring. Amsterdam. 3 Jahrgang. Feb., 1906.

Nell, Chr. A. C. Uitkomsten der waarnemingen omtrent poolbanden, van 1874 tot 1894 hoofzakelijk te Groningen en te Oosterbeek (bij Arnhem) verricht door Civ. Ing. H. I. Groneman. Pp. 145-150.

Nell, Chr. A. C. De halo's. Pp. 157-162.

RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

H. H. KIMBALL, Librarian.

The following titles have been selected from among the books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Most of them can be loaned for a limited time to officials and employees who make application for them.

Asociacion de Ingenieros y Arquitectos de Mexico.

Anales. Tomo XII. 341 pp. 8°. Mexico. 1904.